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LETTER REGARDING ADDITIONAL TECHNOLOGIES FOR TREATABILITY STUDY AT OPERABLE UNIT 4 (OU 4) NTC ORLANDO FL
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Southern Division
Naval Facilities Engineering Command
ATTN: Ms. Barbara Nwokike, Code 1873
P.O. Box 10068
2155 Eagle Drive
North Charleston, SC 29406

Dear Barbara:

SUBJECT: **Operable Unit 4 Treatability Study**
Technology Selection Letter
Naval Training Center, Orlando, Florida
CTO #135, Contract No. N62467-89-D-0317

The purpose of this letter is to identify the technologies that require treatability studies for possible future remedial implementation at OU 4. Selected remedial technologies will move into the feasibility process. Technologies that require additional information regarding performance, implementability, and full scale cost to adequately perform a feasibility evaluation will be recommended for treatability testing. Ordinarily, screening of remedial technologies and treatability studies would occur following the remedial investigation (RI) while entering the feasibility study (FS) process. However, the interim remedial action (IRA) activities conducted at OU 4 have provided some site characterization data to allow technology screening and treatability studies to run concurrent with RI.

The OU 4 RI/FS Plan of Action (POA) (dated November 1996) recommended in situ bioremediation, reactive wall, and in situ chemical oxidation for pilot testing. However, in the time since the POA was developed, a significant amount of information about the contaminants of concern at OU 4 has been presented. This letter considers the POA recommendations in the context of all site characterizations conducted to date. Additionally, there continues to be significant interest in the direction of technology usage at OU 4 by a number of parties, most recently, the phyto-based proposal from USEPA and the University of Georgia.

Based on our current understanding of OU 4, the most likely approach to site remediation will include some form of source control to reduce groundwater concentrations, in concert with groundwater remediation to address contamination that has migrated away from the source. The technology screening therefore focused on technologies most appropriate for **source remediation** and **groundwater remediation**. Some technologies considered could also be effective in remediating both the source area and groundwater. Source technologies recommended for pilot testing are air sparging and in situ chemical oxidation. Groundwater technologies recommended for pilot testing are bioremediation and reactive wall. These technologies are all *in situ* alternatives that will actively mitigate the source areas

or offer passive remedial solutions for groundwater after source control. Soil contamination that may exist will be handled in concert with any overall solution and will be better defined during the RI.

SOURCE AREA RECOMMENDED TECHNOLOGIES.

Chemical Oxidation Technology. An injection of liquid or gaseous chemical formulations into the contaminated portion of the aquifer could be used at OU 4. When the chemicals intercept VOCs, an oxidation process occurs. An oxidizer reacts with organic contaminants to produce carbon dioxide and water. When gaseous chemicals intercept contaminants, volatilization is enhanced and oxidation occurs. Site-specific bench-scale studies could be required to develop design parameters (such as VOC degradation rates) prior to field application. Pilot testing would be performed to evaluate system configurations, radius of influence, potential effects to the lake environment, and costs.

Air Sparging Technology. In situ air sparging technology is the process of injecting compressed air at controlled pressures and volumes into the saturated subsurface to remove VOCs without extracting groundwater. The treatability study would evaluate both air sparging and SVE technologies. The pilot test would: 1) estimate the efficiency for removal of VOCs; 2) estimate VOC emission rates (both with SVE and without); 3) evaluate the potential for the water table to mound; 4) predict and evaluate the path of air flow in the subsurface to assess the possibility of air migrating horizontally beneath the hard layer; 5) evaluate potential changes in aquifer characteristics; and 6) determine the number of sparge wells and SVE wells that are necessary by measuring the radius of influence.

In-Well Stripping Technology. This technology may also be used for source remediation. However, a pilot test would not be required, since data will be gathered on this technology during the IRA.

GROUNDWATER RECOMMENDED TECHNOLOGIES.

Bioremediation. The presence of TCE and cis-DCE in groundwater at OU 4 demonstrates that anaerobic biodegradation of PCE is occurring. However, the degradation rate has not been defined, nor have the conditions contributing to the biological processes been completely evaluated. Because the contaminants are not degrading rapidly enough to meet surface water standards, the IRA will intercept the plume to prevent VOC contaminated groundwater from reaching the lake.

After source control has been achieved, groundwater VOC concentrations may be reduced, allowing natural attenuation to adequately degrade the remaining VOCs and meet surface water standards without further treatment.

The bioremediation treatability study will focus on defining the aquifer current conditions and degradation rates, and identifing potential techniques to enhance the biodegradation, should it be necessary in the future. This study will primarily entail groundwater sampling and laboratory bench scale work. This is in contrast to the POA, which anticipated a long term field pilot study.

The *in-situ* bioremedial approach involves enhancing the activity of natural bacteria that are capable of biodegrading PCE, TCE, cis-DCE and vinyl chloride should this be required to achieve remedial goals. *In-situ* bioremediation requires bench-scale testing to determine if natural chlorinated solvent biodegradation can be enhanced. Bench-scale testing is also required to determine site specific biodegradation rates as well nutrient and electron donor/acceptor loading requirements.

Permeable Reactive Wall. A permeable reactive wall constructed of zero-valent iron filings could be installed at OU 4 to intercept contaminated groundwater. VOCs contacting the filings are degraded by the process of abiotic dehalogenation. Site-specific bench-scale studies are required to develop design parameters (such as VOC degradation rates) prior to field application. Modeling studies would be performed to evaluate system configurations, wall thickness, potential effects to the lake environment, and costs.

Phyto-based Technologies. A draft proposal was submitted to the Navy by the USEPA and the University of Georgia. As you are aware, the Orlando Partnering Team requested additional information on phyto and suggested that a final proposal be submitted to Southern Division. It appears that there may be some overlap with phyto requirements and with what the scope of work calls for. A future meeting to discuss phyto-based technologies has been recommended.

The current schedule for OU 4 calls for the development of the RI/FS work plan and the treatability study workplan during May and June, so that the treatability studies can begin in the fall of 1997 with the RI field work. The treatability requirements for the above technologies will be developed, with the expectation that each of the technologies can be evaluated by the summer of 1998. Note that these recommendations may need to be modified, as the development of the workplan may find some technologies may not really be appropriate.

In closing, we look forward to discussing our recommendations at the May OPT meeting. Following OPT and Navy consensus, we will begin to develop the treatability workplan to address the chosen technologies. The workplan will also include a detailed schedule for implementation. If there are any questions or comments concerning this letter, please contact Mark Salvetti at (617) 245-6606 or Harlan Faircloth at (407) 895-8845.

Very Truly Yours,

ABB ENVIRONMENTAL SERVICES, INC.

John Kaiser
Installation Manager

cc: Cliff Casey, Southern Division
Wayne Hansel, Southern Division
Mike Maughon, Southern Division
Steve McCoy, Brown & Root, Inc.
John Mitchell, FDEP
Mac McNeil, Bechtel
Nancy Rodriguez, USEPA
Fred Sloan, USEPA
Lt. G. Whipple, NTC, Orlando

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